



Volume 43, Number 2

Fall/Winter 2024

Journal of the CALIFORNIA HISTORICAL RADIO SOCIETY



*Renel Brooks-Moon &
Ben Fong-Torres
Announce BARHOF Class of 2024*

**Radio
Day
Live
2024**



*Hosts Kim Wonderley
& Terry McGovern*



*Joe Selkregg bidding
Dan Healy looks on*



Auctioneer Don Bleu



Auctioneer Rosie Allen



Royal Society Jazz Orchestra

FOR THE RESTORATION AND PRESERVATION OF EARLY RADIO



FROM THE BIRTHPLACE OF BROADCASTING
CALIFORNIA HISTORICAL RADIO SOCIETY
HOME OF THE BAY AREA RADIO MUSEUM & HALL OF FAME

The California Historical Radio Society (CHRS) is a non-profit educational corporation chartered in the State of California. Formed in 1974, CHRS promotes the restoration and preservation of early radio and broadcasting. Our goal is to enable the exchange of information on the history of radio, particularly in the West, with emphasis on collecting, preserving, and displaying early equipment, literature, and programs. Yearly membership is \$40 (\$50 non USA).

CHRS Museum in Alameda

CHRS has been fortunate, through the generosity of its donors, to purchase a home for the CHRS museum and education center. It is located at 2152 Central Avenue. The building was built in 1900 as a telephone exchange.

CHRS volunteers are actively restoring the building to make it optimal for use. Our goal is to create an environment to share our knowledge and love of radio and enable us to create an appreciation and understanding for a new generation of antique radio collectors and historians.

Please come visit us any Saturday 9am to 3pm. Visitors and groups welcome at other times by appointment; Contact Steve Kushman.



Contact us:

CHRS, PO Box 31659, San Francisco, CA 94131
or info@californiahistoricalradio.com

Visit us at: www.CaliforniaHistoricalRadio.com

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Steve Kushman – RC Project Manager
Jaime Arbona – Secretary, Mailing, Donations
Richard Watts – Treasurer, Journal Editor
Scott Robinson – Technical Ops.
Mike Adams – Chairman Emeritus, Webmaster
Dennis Monticelli – Education, Amateur Radio Ops.
Rachel Lee – Executive Director

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CHRS Central Valley Chapter (CVC)

Eddie Steeves – Chairman

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Kent Leech – Auction Manager
Paul Bourbin – Landscape Ops.
Tom Bonomo – Investments, Name Badges
Dave Billeci – Video Production
David Vasquez – Electrical Transcription Project
Lunch crew: Keith Scott, Betty Cosmos, Judy Mears

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Front, Rear, and inside Rear covers: Images from Radio Day

From the Editor

John Staples provides a detailed view of the design of the RCA SelectaVision VideoDisc player. I wish to again thank John Okolowicz for a colorful and informative story of mid-century modern design. And I want to thank Arden Allen for recommending presenting a 1984 IEEE article about Safety Requirements for Radio and Television. This is followed by reports on the latest Vintage Television Enthusiasts meet and of this year's Bay Area Radio Hall of Fame Inductees. Philip Monego, Rachel Lee, and Steve Kushman provide updates of CHRS and Eddie Steeves gives us an update of the Central Valley Chapter.

I am always in need of quality content related to broadcast radio, ham radio, and television. If you have something to contribute, I urge you to let me know. I am especially interested in technical content. It can be of two types, a narrow topic in depth or a more broad topic with less depth. Enjoy . . .

Richard Watts, [jrchr@comcast.net](mailto:jrchrs@comcast.net)



From The Chairman

by Philip Monego Sr.

A View from the Chair

As I write this, I was saddened to learn that Mike Adams, our Chairman Emeritus has passed on. Mike was an inspiration to all of us and will be greatly missed. Our condolences to Mike's family and we wish them strength and comfort.

As we look back at all that 2024 brought us, there is much for which to be thankful. I especially appreciate:

- Rachel, our Executive Director, who has managed to organize and deliver on so many of our most important priorities in 2024— Thank you, Rachel!
- Radio Day was supported and produced by the most engaged group of volunteers, sponsors, members, and neighborhood attendees ever. With over 500 attendees all of Alameda most of Alameda now knows who we are.
- We celebrated our 50th anniversary and 10 years of owning our building, both of which are remarkable achievements. They enabled us to bring to life the first of many period exhibits and demonstrations, with more to come hopefully by yearend.
- And then there is Steve Kushman, without his tireless dedication we might not have managed to design, build, and deliver such a significant transformation of our historic home.

Indeed, 2024 has given us much to be grateful for, but it's also made evident what needs to be top of mind going forward. Whether you're a CHRS, SWOP or BARHOF member, or a casual observer, or a radio enthusiast, you continue to show us what's important to the organization, so I'd like to outline some planning priorities.

First, as you continually donate estate collections that improve our exhibits, it's become clear that many of you face the daunting task of planning for how to pass on, donate, sell, or dispose of your family's vast collections. We have seen too many cases of what is described as "hoarding," resulting in family members becoming incredibly stressed trying to understand what is in the best interest of all involved. Families often confide in us that they have no idea what value, if any, can be realized from the collection, or which items to donate, let alone what to do with the e-waste surplus.

We'd like to help. Together, we can advise, plan, and document your wishes for the collection. Please reach out if you or anyone you know is interested in this service.

Second, your board is working to develop a strategic plan to best ensure our future success, which will include opening the museum exhibits to the public and adding plans for programs and classes throughout the year. We believe that executing on our plan will require a capital raising campaign. We of course realize that we could not have achieved all that we have without the generous contributions from our membership, and now that we have demonstrated what good can come from these contributions, we will ask for your help to ensure a financially stable road ahead.

As the year is ending, this might be a good time to review your trust and will to make certain that your wishes are clearly understood. It would also be helpful if you could share with us any plans you have for charitable donations in the coming year.

Again, we appreciate your continued support and wish you all a healthy and safe holiday season!

Philip



A collector's legacy.

From The Executive Director

by Rachel Lee

Charting New Frequencies: Reflecting on a Year of Growth and Looking Ahead

As I reflect on my first year as Executive Director of the California Historical Radio Society (CHRS), I am filled with pride and gratitude for the remarkable progress we have made together. The past year has been a period of growth and a deepened commitment to our mission of celebrating and preserving the history and legacy of electronic communication. I'm excited to share our accomplishments and offer a glimpse into what lies ahead for CHRS in 2025 and beyond.

Strengthening Our Community Through Successful Events

This past year, our annual "Radio Day by the Bay" event was more than just a celebration—it was a resounding success that highlighted the enthusiasm and dedication of our members, volunteers, and the broader community. We saw a significant increase in participation, both in attendance and in volunteer hours, which translated into greater engagement and revenue for CHRS. This success underscores the incredible passion our community has for communication history, and I am committed to making next year's event even more impactful.

Engaging New Audiences Through Educational Programs

Education remains at the heart of our mission, and this year we offered programs that fostered a deeper appreciation for the science and art of radio. Our programs ranged from hands-on radio repair workshops, to speaking events, to student field trips and group tours. The visit by the Encinal's KJTZ broadcast class to record student written radio plays at our 1950s broadcast studio was a particular highlight. Our school outreach programs help integrate radio history into the regular broadcast curriculum and facilitate cultivation of a new generation of radio enthusiasts to preserve this important cultural heritage.

In the remaining 2024 and 2025, we plan to broaden these initiatives. We're hoping to introduce new programs that connect young people with experienced radio historians, broadcasters, or technicians, providing valuable skills and insights into these fascinating fields.

Enhancing Our Preservation and Restoration Efforts

The CHRS facility continues to serve as a showcase of our collection and a working space for radio restoration allowing visitors to not only see history but to hear it too. In addition, RC is also undergoing restoration of our historic Alameda Telephone Exchange building. This year, we undertook the revealing of the original front of our building. We have removed the mid-century façade and are reforming the original 1900s front. This restoration has and will enhance the visitor experience, ensuring CHRS remains a vibrant cultural destination.

We are also pleased to announce our very first professional museum display. This exhibit covers 1900-1920 and was unveiled with great success at Radio Day. Docents were busy all day giving tours of the display. We are now beginning the next decade exhibit and will keep you updated as to the opening dates for each display as they become ready.

Fostering Collaboration and Building Partnerships

The power of partnership has been a guiding principle this year, and we have been fortunate to collaborate with several organizations that have intersecting passions. These partnerships have not only strengthened our programming and expanded our reach but have also brought fresh perspectives and new audiences to CHRS. As we move forward, we aim to cultivate even more relationships with museums, educational institutions, foundations, and community organizations to amplify our impact and promote the rich tapestry of communication history.

Looking Forward: A Year of Opportunity and Growth

As we look to the conclusion of 2024 and beyond, CHRS is focused on leveraging our successes to build a stronger, more inclusive, and more vibrant community. We are committed to enhancing our programs, expanding our digital offerings, and continuing our preservation work, but none of this would be possible without your support. Whether you are a longtime member, a new volunteer, or a first-time member, your involvement is key to our success.

I invite each of you to stay connected, get involved, and help us keep the magic of radio alive. Together, we can ensure that CHRS continues to thrive and inspire for many years to come.

◇

CHRS Radio Central Façade Restoration Update - Recreating 124 Year Old Architectural Details

by Steve Kushman, Project Manager

CHRS was fortunate enough to be able to purchase the building at 2152 Central Ave. in Alameda, CA in 2014. It was the first telephone exchange building in Alameda built by the Sunset Telephone and Telegraph Company in 1900 and is now known as CHRS Radio Central. It was built in the California Mission Revival architectural style.



1900-1960



1960-2024



Today

In about 1960, the building was owned by the Church of the Nazarene. And in those ‘modern’ times ‘old fashioned’ things were sometimes looked upon unfavorably. So, the Church hacked off most all of the original façade details including the stairway and erected a flat, cinder block decorated false front. When CHRS bought this building 10 years ago we knew what was under the false wall. And 10 years later CHRS is restoring our building to its 1900 classic style.

Many processes are involved in this restoration, but we will now focus on one. All of the missing façade details were originally made from brick covered with stucco which is a process that is prohibitively expensive today. For some years now, much of this vintage detailing has been made using laser cut high density styrofoam, covered with sticky mesh and then covered with stucco. The finished product looks, feels, paints and weathers like the original but is much more affordable, lighter, easier to work and will last 100 years!

The picture essay that follows is the multistep CHRS process to recreating a 124 year old building style, missing for 60 years. Watch for more updates.



After the cinder block front was removed, the original details were measured.



A model of the arches and dentils was built from foam, wood, and cardboard.



The model is complete and ready for reproduction.



Aquilles of Bay Area Foam Shapes Design is happy with the result.



New reliefs and corbels arrive made from high density foam and covered in mesh and stucco.



Missing for 60 years, the reliefs and details are being replaced.



September 2024
Radio Central looking like 1900.



CHRS Central Valley Chapter News

by Eddie Steeves

Hello from the CHRS Central Valley Chapter.

We have had a pretty busy, productive and fun filled summer.

On June 9th, we had our annual BBQ at the clubhouse where the membership, friends and family once again gathered and enjoyed great food and conversation. Photos of a few attendees shown to the right.

We continue to meet regularly for technical sessions, and repairing and restoring radios, consoles and record players for ourselves and friends.

We donated a beautifully restored console to the Turlock Senior Center, equipped with wireless bluetooth.

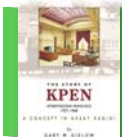
We are looking forward to closing out 2024 with continued fun dedication in keeping vintage radios alive and well through their beauty and entertainment for all.

For an update on all our activities, visit CVC at www.cvantiqueradio.com.

Best regards,
Edward Steeves
Chairman CHRS CVC



CHRS Publications



The Story of KPEN: A Concept in Great Radio! Gary Gielow has written a book chronicling the tales of two young men from Stanford, he and James Gabbert, who brought Stereo and new ideas to the FM radio band in the late 1950s and 1960s. This book is the definitive history of KPEN 101.3 FM, the 2015 BARHOF Legendary Station. 100% of the proceeds benefit CHRS. Available in the Museum Store or on the website.

The Radio Boys And Girls—Radio, Telegraph, Telephone and Wireless Adventures for Juvenile Readers 1890-1945 covers more than 50 volumes of wireless and radio themed fiction, offering a unique perspective on the world presented to young readers of the day. The values, attitudes, culture and technology of a century ago are discussed. Available at Amazon.com



Behind the Front Panel: The Design and Development of 1920's Radio by David Rutland has been remastered by Richard Watts for CHRS. With emphasis on radio technology, Rutland describes the development of 1920s tubes and radio circuitry designs by De Forest, Marconi, and other inventors and manufacturers. A classic! Buy at Amazon.com

CHRS Journal Special Edition — Television a compilation of original articles on television, including articles by Malcolm Baird on his famous father, British television pioneer-inventor, John Logie Baird, Don Godfrey's historical bios on CF Jenkins and Philo Farnsworth, plus restoration and technical articles from CHRS members. Available at Amazon.com



CHRS Getting Involved in the Community

by Richard Watts

The focus of CHRS has for years been the restoration of the building to prepare it to be a meeting place, museum, and education center. CHRS has been focused on serving its base of vintage radio and television collectors and broadcasters, who have been very generous in providing volunteer and monetary support.

Now that we have nearly completed the building renovations, we look forward to widening our support base by also serving the local community. CHRS is fortunate to be located in Alameda who continually demonstrates they are willing to repeatedly support interesting venues and events. Further, the community appreciates its historic architecture of Victorians and the like. With the completion of the facade restoration back to its original circa 1900 appearance, CHRS now fits right in.

Now we are working to expand our presence in the community and to engage and entice the local public to make us part of the Alameda experience, and be worthy of their support. Initially, we are engaging the public in several ways.

Community Outreach: CHRS has an information and demonstration booth at local Alameda events including business association events and the Antique Car Show. Our participation at Antique Faires has been successful in introducing faire goers to vintage radio. Radio Central is also offered as a national and local election polling site. Rachel will be participating on behalf of CHRS in the Alameda Chamber Foundation.

For example, on the 4th of July, CHRS entered a float displaying and demonstrating vintage radio including CHRS member Miles Steuding as the DJ and narration by Steve Kushman. Alameda mayor Marilyn Ezzy Ashcraft presented Rachel Lee with a second place trophy. Our presence in the parade led to increased public attendance at Radio Day, which had 500 attendees, twice the turn out as in the past.

Radio Day attractions were expanded this year to further engage the public including the live Radio Play and the Royal Society Jazz Orchestra which are always popular. This year CHRS also added vendor and interest group booths, book signings by local authors, and food trucks which proved very successful in rounding out the attendees activities.

Education: CHRS connects with local schools to offer educational opportunities for their students, including tours, and hands-on opportunities. CHRS hosts workshops where attendees can learn workshop safety and the basics of restoring vintage radios, blending education with hands-on craftsmanship. The CHRS monthly lecture series is open to the public and has offered lectures from a variety of noted personalities, entrepreneurs, and experts. Recent lecturers have included Ben Fong-Torres, Dan Healy - producer and sound guru for the Grateful Dead, and James Gabbert. The most recent lecture was from Ralph Simpson who presented the theory, construction, and operation of the WW2 cryptography device, the German Enigma, and how it was decrypted by the Allies.



Rachel accepted the award for CHRS from Alameda Mayor Marilyn Ezzy Ashcraft.



The CHRS float pulled by Rachel's husband in their Hummer decked out for the occasion.



To further attract and engage the local public, interest groups and vendors were invited to have a booth during Radio Day. This includes the Alameda Pinball Museum, C. Crane portable radios, book signings and sales by local authors, broadcast organizations including KFRC's mobile studio which they opened to the public, and food trucks. C. Crane gave several radios in the door prize drawing.



The RCA SelectaVision VideoDisc Player

By John Staples



The RCA SelectaVision video player, a hodgepodge of lofty ideas and technology, arrived too late and too ambitious. Its failure eventually led to the demise of RCA itself.

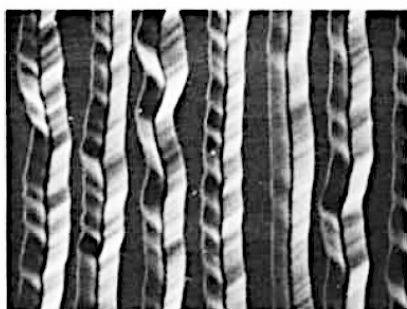
What happened? From the RCA design and service documents and with some help from Wikipedia, I will describe its aspiring technology and shortcomings. Other pictures by the author.

Background

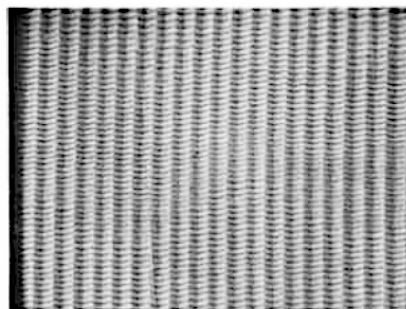
In the mid 1960's no portable video format was yet available for home entertainment. Tape-based platforms (Betamax, VHS) had already been started in development, but it would be at least ten years before they were introduced to the public. In addition, pre-recorded tapes would be expensive and difficult to mass-produce at that time. RCA already had in-house expertise and an extensive long-playing record production facility, and questioned whether a vinyl disk-like format could provide video programs of up to two hours and be cheaply manufactured.

The long-playing audio vinyl disc could provide, on both sides, up to two hours of audio programming with a frequency range of 20 kHz or even more (for a four-channel format). Could a mass-produced vinyl disc provide an equal playing time of supporting a 3 – 4 MHz video bandwidth and two audio channels? This would require more than two orders of magnitude of data density. Could it be done?

The SelectaVision Technical Standard



(a) STEREO DISC AT 200x MAG.



(b) EM VIDEODISC AT 2000x MAG.

Scanning electron microscope comparison of a stereo audio disc surface at 200x magnification and a VideoDisc surface at 2000x.

The standards RCA finally agreed upon called for a nominal 12 inch diameter vinyl disc, operating at 450 RPM (375 for the European PAL standard) with a groove spacing of 9541 grooves per inch or 2.7 micron inter-groove spacing. One micron is 10^{-6} meter, or 0.000039 inches. (The width of a human hair is 50-100 microns.)

The luminance video signal would be FM modulated with a frequency swing from 4.3 MHz (sync tip) to 6.3 MHz (white). The 3.58 NTSC color

subcarrier would be heterodyned down to 1.53 MHz and added to the luminance signal.

Two audio streams would be FM modulated on 716 kHz and 905 kHz carriers and added to the combined video signal. This way, two independent monaural audio channels are provided.

Timing information is added to the vertical retrace interval to provide a time-based search function.

The combined signal is impressed onto the vinyl disc as a vertical height modulation in the groove that is separated by 2.7 microns from its adjacent groove. Thin protective passivating and lubricating layers cover the grooves.

The composite video and audio signal embedded in the vinyl disc is detected through a specially-shaped stylus that tracks along the groove whose vertical undulations that may be as close together as 0.5 micron. The long but narrow stylus does not deflect vertically but detects variations of capacitance between a trailing metallic electrode on the stylus and the carbon-loaded vinyl.

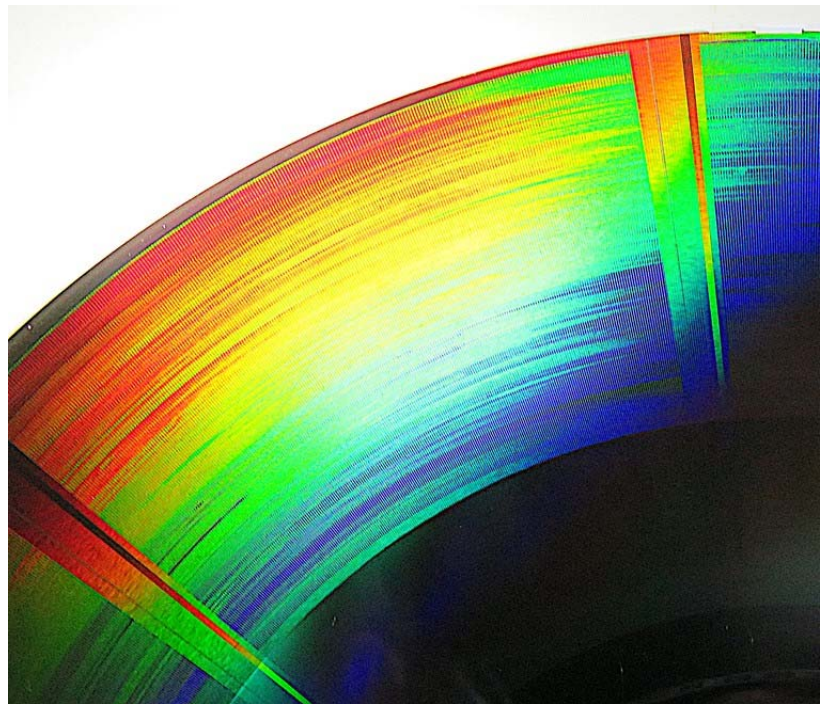
The Disc

To cram data at a density of more than two orders of magnitude onto a 12 inch vinyl disc a new method of encoding a wide-band signal into mechanical undulations onto the disc, and a new method of accurately detecting the undulations on playback is required. The length of the track of a 60-minute program on one side is about 12 miles.

A stylus tracks the grooves, 2.7 microns apart, where the minimum spacing of the data along the groove is 0.5 microns. (The wavelength of green light is about 0.4 microns.) In fact, the disc resembles a large diffraction grating that generates brilliant colors when illuminated with white light.

Reading the disc senses the variation of capacitance between the hills and valleys of the modulations and the underlying vinyl, which is loaded with finely dispersed carbon to render the substrate conductive.

The video program is recorded on the disc, eight 262.5 line NTSC fields or four 525 line NTSC frames per revolution. This image of a sector of the disc shows two of the eight vertical retrace gaps, which include additional timing information used for the disc search and timing function. Small lines may be seen in each 45 degree video portion, each represent one complete horizontal line scan of 63 microseconds.



Because of the close spacing of the grooves, the disc can display brilliant colors when illuminated with white light.

The Disc Caddy

With such data density, any dirt, dust or finger prints on the disc surface could disrupt tracking. The disc must be protected from the environment, and is therefore contained within a protective caddy.

The disc is enclosed in a plastic caddy that includes a felt brush that wipes the disc on each insertion.

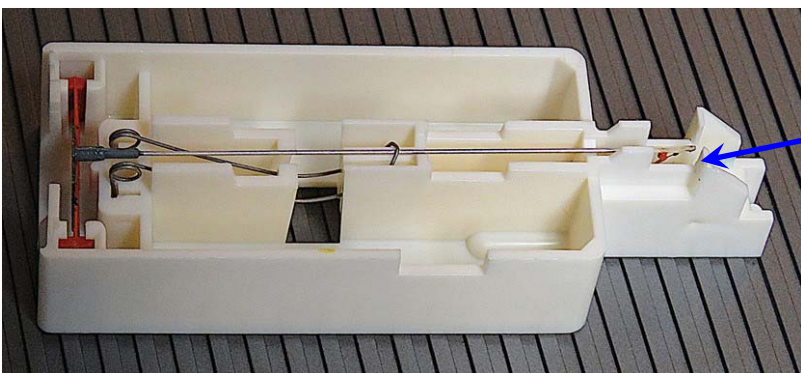
The caddy is inserted into the player and then withdrawn, and the player retains the disc. The disc must be manually turned over at the one-hour point, and the caddy encodes which side is being played, although this is very easy to override.



Protective disc caddy.

The Stylus

A specially shaped stylus, shaped somewhat like a boat, tracks along in the groove but does not move up and down. A metallic strip on the trailing edge of the stylus is an electrode that senses the capacitance changes to the vinyl substrate.



Stylus cartridge assembly.

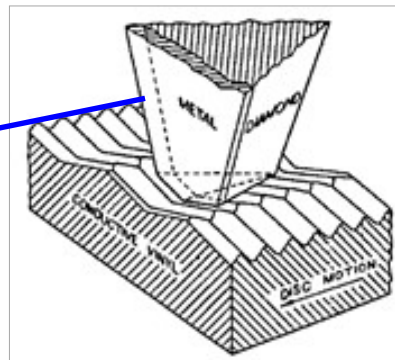
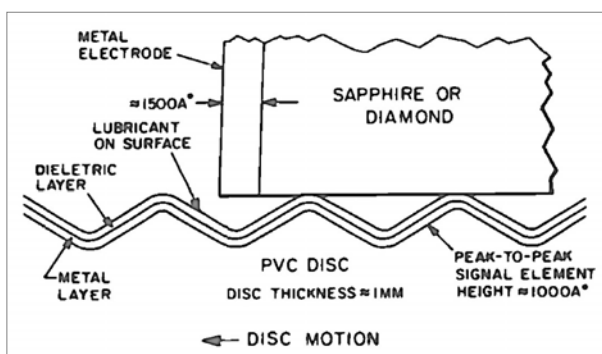
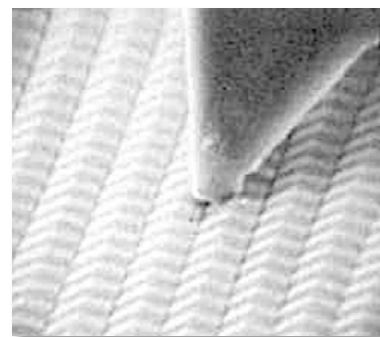


Diagram of the stylus and its position on the 9524 groove-per-inch disc .

These capacitance changes modulate the resonant frequency of a 910 MHz tuned circuit near the stylus. A 915 MHz oscillator excites the tuned circuit, slightly off resonance, and the capacitance variation modulates the amplitude of the 915 MHz signal. It is this amplitude variation of the 915 MHz signal that is detected and demodulated, yielding the composite video signal and both audio channels.



Another view of the stylus on the coated disc.

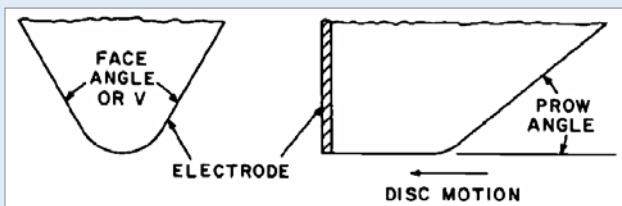
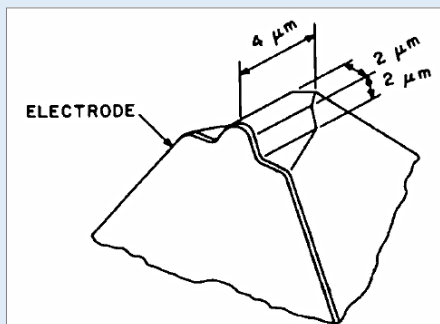


A scanning electron microscope image of the stylus on the disc.

The stylus is long in comparison to the modulations on the disc. It is formed from sapphire or diamond with a cross section of about 2 microns that fits into the groove.

The stylus is replaceable by the user. The diamond version is specified at 1000 hours of play. A retraction mechanism is released when the disc plays.

Details of the stylus. Below the stylus and underlying electrode. Upper right is the shape of the stylus. Lower right is an enlarged image of the stylus.



Tracking Mechanism

The stylus tracks the groove in the disc by riding along on a track that keeps it over and parallel to the groove in the disc. A worm gear drive moves the carriage along the disc from the outer radius to the inner radius during play. Front panel buttons allow fast and slow slew of the carrier mechanism.



The tracking mechanism. Right is an enlargement of the gear drive.



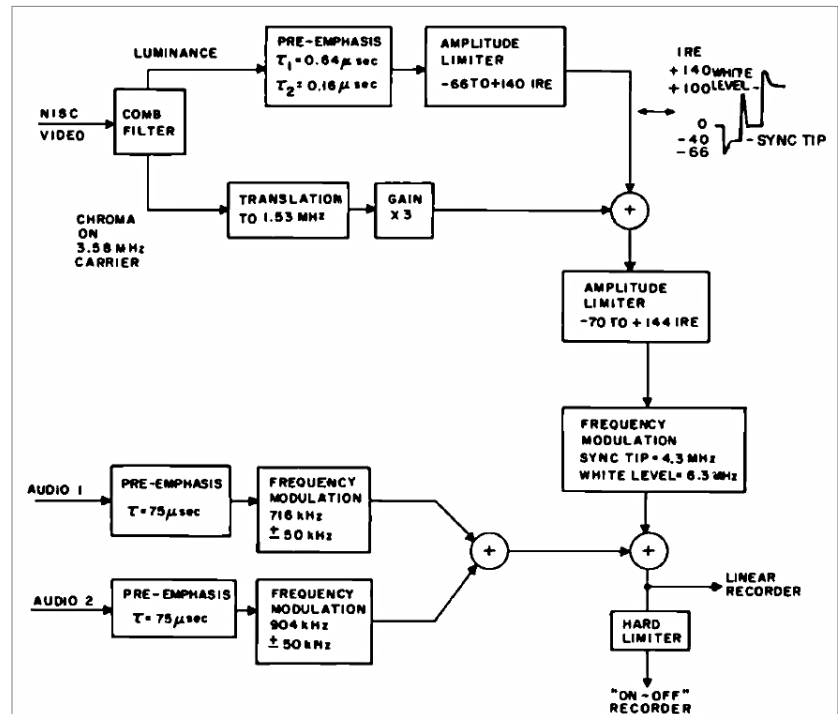
Formatting the Data for the Disc

The video stream is prepared by separating the luminance and chroma channels with a comb filter. The luminance is slightly pre-emphasized to sharpen it and then amplitude limited.

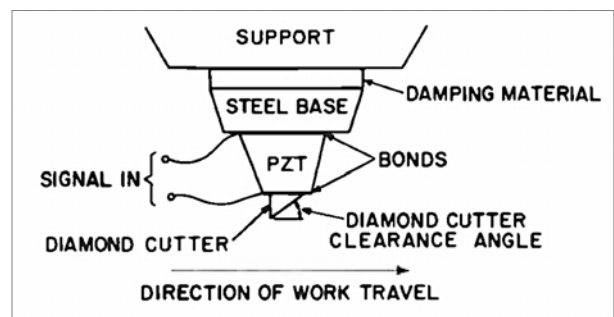
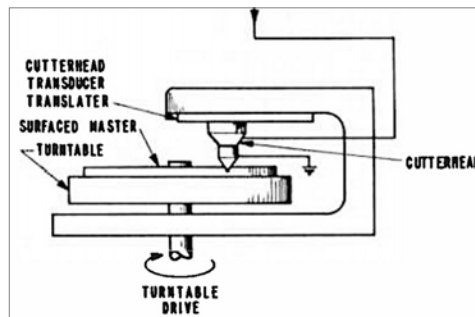
The chroma stream is translated from 3.58 MHz to 1.53 MHz and then added back to the luminance stream, further limited and then applied to a frequency modulator that places the sync tip (black) at a frequency of 4.3 MHz and the white level to 6.3 MHz.

Two audio channels are separately pre-emphasized and then frequency modulated with 716 kHz and 904 kHz oscillators. The FM audio stream is then added to the 4.3 – 6.3 MHz video stream and cut into the disc.

Several methods of mechanically coding the data to the disc that requires a real-time bandwidth of up to at least 6 MHz. Electron beam and optical beams cutting a photo resist with disc speeds much slower and up to near real-time were attempted. A real-time mechanical cutter onto a copper master won out, giving a uniform and reliable product that could be immediately played back for testing.



Block diagram of the data encoding system.



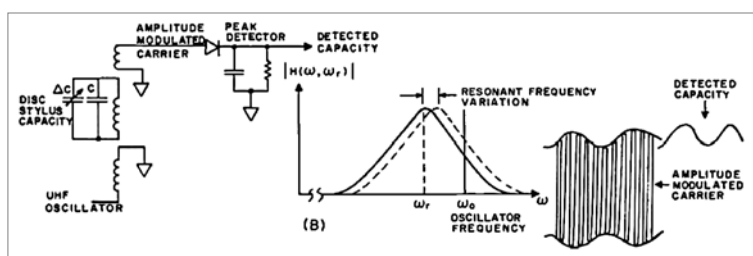
Illustrations of the electromechanical recorder mechanism (left) and the cutter head (right).

After the copper disc master was cut, copies and metallic stampers were prepared and the vinyl discs were produced using the same techniques used for long-playing records.

Playback Electronics

Playback over a frequency range that extends to beyond 6 MHz uses the change of capacitance between a metallic layer on the trailing edge of the stylus and the disc substrate, made conductive by addition of carbon particles to the vinyl.

The metallic layer on the stylus forms part of a 910 MHz resonant circuit that is excited by a 915 MHz oscillator. The nominal 910 MHz resonance is varied by the varying capacitance sensed at the bottom of the 2.7 micron-wide groove. As the resonance swings, the amplitude of the 910 MHz resonator also swings and its amplitude is detected with a crystal rectifier. The signal is further strengthened by an amplifier in the tracking head.



Conversion of the change in capacitance at the stylus to a corresponding change in voltage for playback.

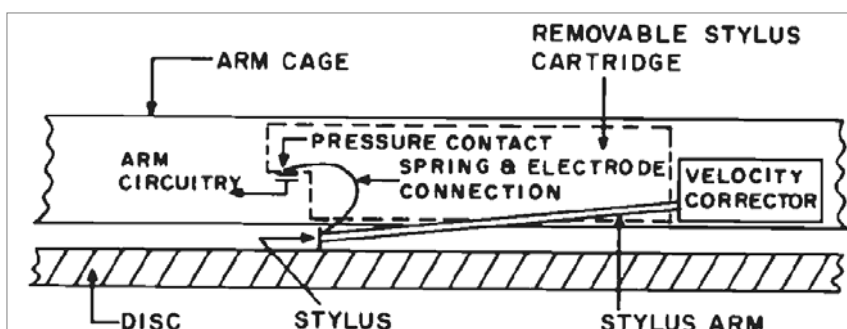
The audio subchannels are separated from the composite stream and demodulated, and the frequency-modulated video recovered. The 1.53 MHz chroma information is translated back to the NTSC 3.58 MHz frequency.

Time Base Corrector (TBC)

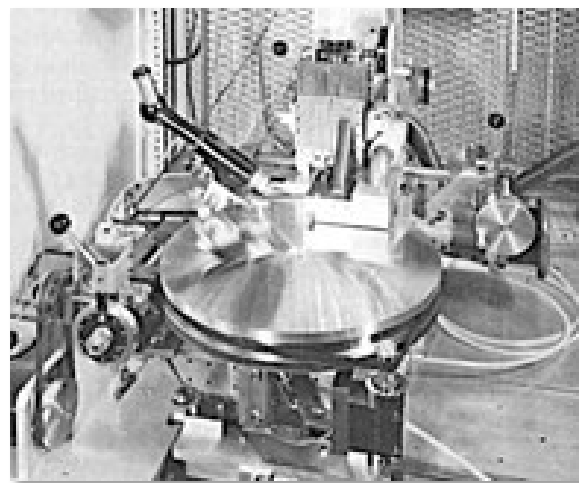
Since this is a mechanical system, variations in playback speed may be caused by, for example, an off-center location of the disc on the playback platter. The chroma subcarrier frequency must be accurately reproduced.

A double time-base corrector is used by the player: one mechanical and one by sensing and correcting the subcarrier frequency.

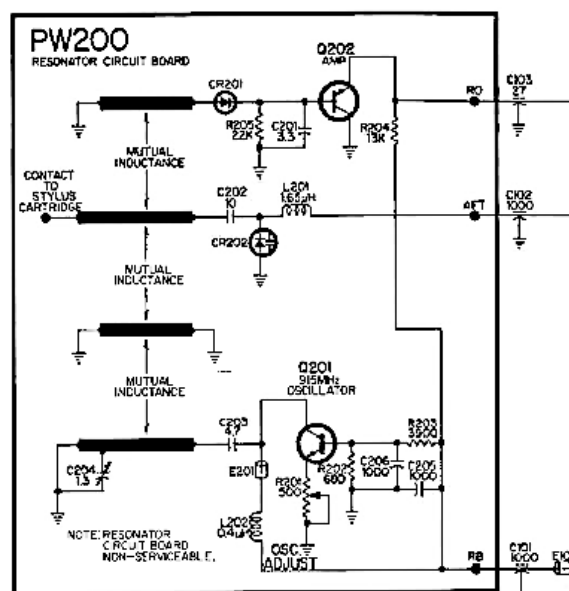
The mechanical TBC uses a fast-acting solenoid at the far end of the stylus support that adjusts the longitudinal position of the stylus along the groove. The frequency response of this system extends into the kiloHertz range. The rest of the TBC action is the modulation of the subcarrier generator to match the correct 3.58 MHz frequency.



Cutaway diagram of the arm cage and stylus cartridge showing the position of the mechanical time base corrector, i.e. the velocity corrector.



Hydrostatic turntable and bore for master disc machining. Consumer VideoDiscs would then be replicated from the master using injection mold and coating processes.



The CHRS Model SGT 250 Player

The California Historical Radio Society has been gifted an RCA Model SGE 250 player, along with several program discs. After some minor repairs the player became operational and several of the discs were played.

The RCA SelectaVision on the bench for evaluation..

Another chance to watch Blazing Saddles.

"Work, work, work, work . . . "



How well does it work?

It has its problems. The 2 micron groove spacing and sensitivity to any contamination on the disc surface will cause video skips and tracking errors, and this unit certainly suffers these, as well as being sensitive to being bumped.

The video quality is quite fine with few artifacts. The color saturation is good, and other video artifacts are not too apparent. The sound quality is good. Note that the two sound channels are completely separate and can be used independently, such as for class teaching instruction.

An extra stylus assembly came with the player, and each exhibited the same amount of skipping and tracking errors as the other.



The RCA SelectaVision ready to play a disc.

Comparison to other disc formats

Laserdisc 1978: analog video, analog then later digital audio. 12 inch format. Limited time per surface. Non-contact playback using laser. Heavy, delicate, cannot be mailed. Player is expensive. Eventually failed public acceptance.

DVD 1996: digital video and audio. Smaller disc. 4.7 and 8.5 Gbyte capacity. Blank discs can be recorded. Playback security lock defeated quickly, not now enforced. Still in use. Was very popular.

Blu-Ray: Increased capacity to 30 – 50 Gbytes, allowing higher resolution video

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The Author

John Staples, W6BM, is a retired Lawrence Berkeley Lab scientist that collects and restores vintage electronic devices.



Mid Century Modern: everything old is new again

By John Okolowicz

Have you ever seen one of the new super-thin wall hanging TVs, like the Samsung Frame? If not, I can tell you that the bulk of the electronics is housed in a separate container that can be hidden away just about anywhere—usually inside a base cabinet right below the TV as shown in Figure 1. When the TV is semi-powered off, you can choose to display whatever you like in the picture frame—pictures of your family or a Van Gogh or a Renoir, or a Matisse, etc. Your choice. (Of course, you can just shut it off and leave it black.)

After I bought it, it occurred to me that the new base cabinet bore a strong resemblance to some vintage stereo cabinets from the 1960s. In those days manufacturers were compelled to offer an interesting assortment of furniture cabinet designs to go along with superb acoustic engineering in order to stay competitive.

Most of those hi-fi cabinets from our youth have probably wound up in a landfill a long time ago. But, it turns out that some of them may actually be worth saving.

A quick look on Ebay revealed many cabinets priced at around \$350. That is significant in itself, but I was further stunned by finding that a handful that were being resold on specialty furniture sites* had prices that exceed \$10K! Yikes!

The highest values favor cabinets that sport a mid-century modern design. The clean lines that are characteristic of this style originated in Europe and became popular here in the U.S. from approximately 1945-69. It was referred to as Danish Modern (or Scandinavian style) because of the large number of Scandinavian furniture manufacturers who were exporting that kind of furniture to America after the end of WW2. In turn, that spawned other similar domestic design variants.

Advertisements from the 1960s tended to use the words “contemporary” or “continental” to designate a modernistic style. Years later this style was re-christened “Mid-Century Modern” by virtue of Cara Greenberg’s 1984 eponymous book *Mid-Century Modern: Furniture of the 1950s*. Nowadays, thanks to the internet, that has been shortened to: MCM.

Early in its life, MCM furniture appealed to upscale consumers with more disposable income living in major population centers such as the northeast, west coast, Chicago and Miami. But, most consumers took a pass on it. Instead, they sought conventional styles to match what they already had. Naturally, manufacturers complied by predominantly manufacturing Early American, Italian, Mediterranean or French provincial.

Let’s turn back the clock and have a peek at some of the MCM console designs that were offered back then.

Motorola is a good place to start. From March 1961 until October 1963 they ran a series of 22 very artfully illustrated 2-page ads exclusively in *Life* magazine with the slogan “Fresh From Motorola. . . new leader in the lively art of



Fig. 1: Samsung Frame TV mounted above a base cabinet (not a Samsung product).

FRESH FROM MOTOROLA... new leader in the lively art of electronics



She was most interested in a good looking piece of furniture. He was after sound—room-filling stereo sound that would reproduce treble, bass and in-between notes with true high fidelity.

They both got what they wanted with Motorola® Stereo Hi-Fi. Drexel cabinet for her. True stereo hi-fi sound for him.

Motorola offers a wide choice of cabinet styles—from the handsome Drexel furniture grouping (in exclusive with Motorola) to Early American or Contemporary cabinets in a variety of finishes.

Motorola Stereo Hi-Fi consoles' sound is beautiful, too. Instead of forcing all the high, low, and mid-range sounds through two speaker systems, Motorola uses three. Two speaker systems give you stereo separation of the high and middle-range notes; a third brings out the all-important, nondirectional bass notes. Result: you get a clean, crisp separation of sounds.

Next time you're in the neighborhood, stop by your Motorola dealer's and see and hear the difference in stereo hi-fi. While you're there, be sure to see Motorola's smartly styled table and clock radios—just the thing for back-to-school gifts.

Smart stuff! Stereo hi-fi is a lot for today! Motorola's new hi-fi system gives you a \$1200 hi-fi system graced finish-on-hamilton and select hardwood units. Price equivalent with others.

Here is architect Louis Dellier's version of a modern suite in the style of the past. The window walls and the light-colored wood paneling are used by the designer. Motorola's TV stereo hi-fi console is taken from Dellier's Drexel furniture grouping.



Here's how the set fits the picture as it looks when you open the sliding door to watch TV. Motorolla Model ST-100, 14" high, 14 1/2" wide, and 14 1/2" deep.



Motorola's model-styled stereo console is a masterpiece of design. It is made by American Custom Craft Co., Cabinet of Michigan woods and handcrafted units.



Stereo hi-fi in Drexel Transistor Grouping console with Motorola hi-fi built-in FM AM and PM stereo. Cabinet of Michigan woods and handcrafted units.



MOTOROLA

Please see representative nearest to you for further details.

Figure 2b shows another ad from April 1963. “Stereo hi-fi that pleases both ear and eye” is the sub- heading.

Fig. 2b: Motorola ad from *Life* magazine, April 12, 1963.

The ad goes on to say:

"You don't even have to be a music lover to enjoy Motorola Stereo Hi-Fi. It's a delight to the eye. Each authentically styled cabinet—Early American, Provincial, Contemporary—commands respect as handsome furniture. . . .

"Many models feature a Vibrasonic sound system which makes it hard to believe you're not listening in a concert hall. This exclusive sound system adds reflected energy to your favorite recordings. By turning a dial, you can tailor the sound to fit the acoustics of any room. Music 'bounces' from walls, ceiling, and floor to make it living and vibrant. . . ."

Just a side note: Do you remember the reverberation fad? It was a "thing" in those days, but only Motorola chose to christen it with the space-age moniker Vibrasonic. Magnavox, on the other hand, chose to use the catch-phrase Astro-sonic to tout their standard non-reverb hi-fi system.

General Electric did not make many contemporary-styled models, but the *Scandia*, their Danish Modern console, is a real beauty (Figure 3). Although available world-wide, it was promoted most heavily in the UK and Australian markets. Here is an excerpt from their ad in the *Australian Women's Weekly*:

"Made wholly by hand in Scandinavian design. The clean line of Scandinavian Modern design is beautifully expressed with veneers in oiled teak or flat walnut. See 'Scandia', along with other General Electric stereos now at better class stores."

Fig. 3: GE *Scandia* ad from *Australian Women's Weekly*, August 21, 1968.

The newest in solid state stereo

Scandia — brilliant sound from tape cassettes, records & radio, in one elegant cabinet

25 watts peak music power. Widest sound separation of any stereo. The 'Scandia' stereo is fully solid-state with 29 transistors and 9 diodes on a printed circuit that is guaranteed for life. With a peak music power of 25 watts you enjoy pure and powerful sound in mono or stereo. The two 10" speakers are set far apart in acoustic enclosures to give you the widest sound separation of any stereo — without the cord confusion of scattergrams. The 'Scandia' stereo is completely outfitted for the very finest listening. There are separate bass, treble and balance controls. The Garrard '3000' record-changer features an automatic stylus cleaning brush and diamond L.P. stylus.

Tape Cassettes Change the Shape of Sound. The international standard tape cassette is the new advance in recorded music. It gives you the purity of tape reproduction in its most convenient form, a capsule the size of a cigarette pack. Eliminates the tedious threading of ordinary tapes, cannot be wiped accidentally and fast-spools in both directions. Record companies have released hundreds of titles on tape cassettes.

Record 'Live' For Immediate Play-back. Pre-recorded cassettes are only half the fun. With the 'Scandia' system you can record live through the microphone provided. Or you can record direct from radio or off discs on the turntable. You can play-back immediately in either mono or stereo. A powerful P.A. system is also provided.

Made Wholly by Hand in Scandinavian Design. The clean line of Scandinavian Modern design is beautifully expressed with veneers in oiled teak or flat walnut. See 'Scandia', along with other General Electric stereos now at better class stores.

GENERAL ELECTRIC

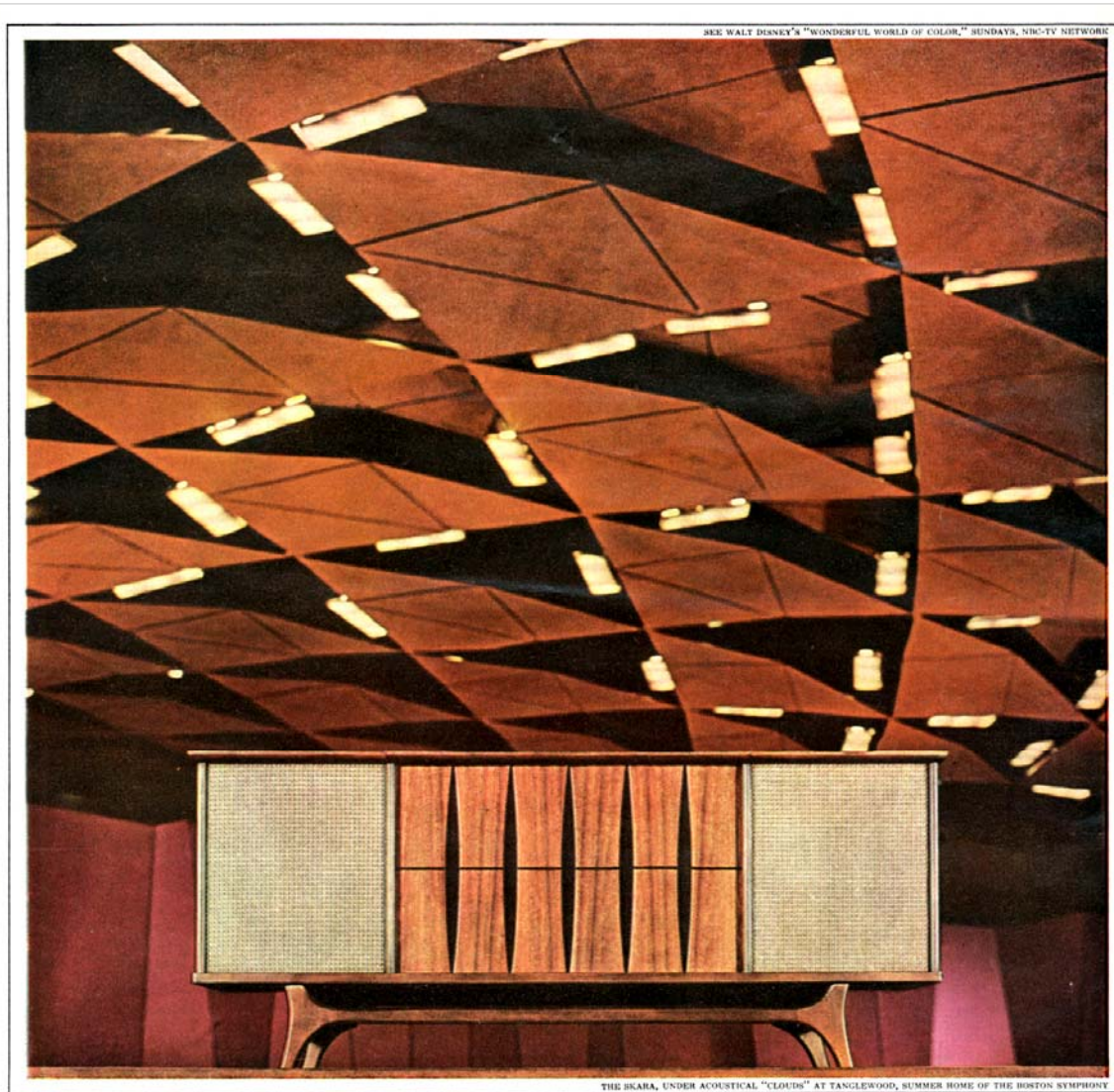
* TRADE MARK OF GENERAL ELECTRIC COMPANY, U.S.A. — WORLD'S LARGEST ELECTRICAL ENTERPRISE

Send for the free colour brochure

N.S.W. Congrove Road, Infield; 360 Hunter Street, Newcastle. Q.T.D. Cnr. Kilmer & Camford Streets, Milton. VIC. 21-23 Cato Street, Hawthorn East. S.A. 778 West Beach Road, Marleston. W.A. 94 Beechboro Road, Bayswater.

August 21, 1968

Page 69



RCA Victor Stereo...realism that rivals the concert hall



When summer's concerts end and music moves inside, let new RCA Victor Solid State stereo show you how little you'll be missing. A case in point: the *Skara* in Danish Modern styling, a full five feet of audiophile treasures, including the precision Studiomatic Changer with Feather Action Tone Arm you see at left. This famous changer offers amazing record protection, intermixes all sizes of same-speed records in any sequence.

The new Solid State amplifier's 120 watts of peak power (60 watts EIA Standard) drives a splendid eight-speaker sound system for startling realism. Solid State means tubes have been replaced by transistors. This makes for less heat, longer component life and crisp, clean sound.

Deluxe 9-tube AM-FM and FM Stereo radio, too. Plug-in jacks for stereo headphones or tape recorder. Terminals for auxiliary speakers. All this *and* record storage!

It's made by RCA Victor—people who know quality and know how to produce it. Before you buy *any* phonograph, compare RCA Victor's ex-

perience in sound reproduction, dating back to the earliest days of the famous "Victrola"® phonograph. Remember, more people own RCA Victor phonographs than *any* other kind. Discover new RCA Victor Solid State Stereo for yourself—see it at your dealer now.



The Most Trusted Name in Sound

Tmk(s)®

Fig. 4: RCA *Skara* console from *Ebony* magazine, October 1964.

RCA apparently considered the *New Yorker* magazine's readers to be a major market for their contemporary models. At least that's where the bulk of their ads were placed. Between 1964 and 1968 eighteen unique stereo cabinet designs were advertised, but only four were Danish Modern. Those were given Nordic names: *Skara* (shown in Figure 4), *Svalbard*, *Skagen*, and *Finlandia*.

They stressed acoustic quality rather than cabinet design in the body of the ad: "RCA Victor Stereo. . . realism that rivals the concert hall."



If you want stereo that will bring you
a lifetime of listening pleasure...

why not get the best

When you buy console stereo, choose the one you'll always be proud of. Because of the way it sounds . . . because of the way it looks. And that's Zenith Stereo!

Zenith Stereo brings you brilliant, true-to-life sound reproduction. Lows are rich and resonant. Highs are bright and clear. You'll thrill to the complete range of dynamic stereo sound.

And Zenith Stereo looks as good as it sounds. Every Zenith cabinet is an authentically styled period piece, crafted from select veneers and hardwood solids. You'll find a wide range of prices in fine furniture styles to complement the beauty of your home.

Zenith Stereo features the world's most advanced console components, FM, AM, Stereo FM Radio. Zenith's Stereo Professional Record Changer with the exclusive Micro-Touch® 2G Tone Arm. And a Solid-State Amplifier delivering 320 watts of peak music power to eight perfectly balanced speakers (including two giant 15-inch woofers and a pair of exponential horns) in a completely sealed, full-width sound chamber. Featured above: the Lund, Danish Modern styling, Model X960W. Lower left: the Orchestral, Early American styling, Model X968M.



ZENITH
The quality goes in before the name goes on

Fig. 5: Zenith Lund from *Time* magazine February 17, 1967.

Zenith's attractive Danish Modern version (Figure 5), the *Lund* (Model X960W), appeared in both *Time* and *New Yorker* magazines under the heading "If you want stereo that will bring you a lifetime of listening pleasure. . . why not get the best." This model frequently can be spotted on resale sites like Ebay both with and without electronics.

Admiral, on the other hand, went out of their way to highlight a few Danish Modern designs but they didn't assign them Nordic names as did their rivals. Model YG8201 is shown in Figure 6 with the headline: "New Admiral 360-watt solid state stereo sounds as rich as it looks!" It continues on to say:

"Does this luxurious cabinet just sit there, looking beautiful? Certainly not! It does remarkable things. Its 75" width gives amazing stereo separation for its eight speakers."

As the stereo hi-fi technology matured, specialty manufacturers such as Fisher, Macintosh, Kenwood and others jumped in with higher performing equipment. Customers could choose to forgo the expense of a cabinet altogether and showcase their equipment on shelves (like E. H. Scott's customers did back in the 1930s to proudly exhibit the gleaming chrome chassis).

Or, consumers could purchase a custom cabinet from either a specialty furniture manufacturer like Barzilay or from one of the many electronics suppliers (i.e. Allied Electronics, Lafayette Radio, or Heathkit Electronics) that were sprouting up across the country in suburban malls.

Barzilay Furniture Company was located in Gardena, CA, and was one of the most successful independent cabinet maker. Cabinets could be purchased either fully assembled or as a kit in designs that covered the gamut from traditional to contemporary. They also offered a large shelving unit, called the Multispan, allowing avid stereophiles to fully expose their stereo components.



Admiral Solid-State Stereo YG8201, Danish Modern Styling

New Admiral 360-watt solid-state stereo sounds as rich as it looks!

Does this luxurious cabinet just sit there, looking beautiful? Certainly not! It does remarkable things. Its 75" width gives amazing stereo separation for its eight speakers. Admiral 360-watt sound comes alive with breathtaking beauty, spreading across your room like a giant orchestra on stage!

Behind this realism, little things count: the tiny, SM-1 solid-state cartridge doesn't depend on record grooves to generate power as ordinary types do, because it's amplifier-powered.

You adjust Admiral Vari-Gram tone arm, 0 to 4 grams. You get ideal tracking pressure, for maximum fidelity, minimum record wear. Records play flawlessly for virtually a lifetime!

Hear this quality Admiral 360-watt solid-state stereo, complete with solid-state FM/AM, FM stereo multiplex radio. It's guaranteed by Admiral for five years!* Quality Admiral Solid-State Stereo Consoles, \$200" to \$715."

Admiral
MARK OF QUALITY THROUGHOUT THE WORLD



Admiral Solid-State Stereo YG8153, Spanish Provincial Styling Admiral Solid-State Stereo YG8121, Italian Provincial Styling

*5-year warranty: Admiral warrants each new solid-state stereophonic instrument to be free from defects in factory workmanship or materials under normal use for 90 days after date of sale to consumer; the FM/AM stereo multiplex radio tuner, pre-amplifier, amplifier and SM-1 phonograph cartridge element are so warranted for 5 years. Admiral obligation is limited to supplying suitable replacement parts. Warranty is effective only if the instrument is registered with Admiral within 10 days after date of sale to consumer. Admiral, Chicago, Admiral Canada, Ontario. **Manufacturer's suggested list price. Slightly higher, some areas.

Fig. 6: Admiral YG8201 from *Life* magazine, September 25, 1964.

Ira (Spiro) Barzilay (1919-2006) formed the company after serving in WWII and it lasted until around 1986 at which point he retired. According to his obituary he was a child prodigy on the piano and appeared as the piano playing kid in "Our Gang" comedies of the 30's. A decorated WWII Captain in the Army Corps of Engineers, he landed at Normandy on day two of the invasion and oversaw the rebuilding of the Bridge at Remagen (note that in 1969 a movie was made of this battle).

Jack Benveniste was Barzilay's chief designer and is mentioned in nearly every one of their ads.

Ensemble 19A-2, one of the models from their Precedent Group, is shown on the cover of one of their advertising brochures (Figure 7a, top). Here is a snippet of the description:

"... It is so named because it, indeed, set a precedent for the styling of contemporary stereo furniture that many have followed. The basic concept using modular component and speaker cabinets of clean design with classic proportions has achieved such complete acceptance from decorators, engineers, and discerning buyers that it is generally regarded as America's most popular contemporary furniture for housing stereo components."

"Each cabinet is available three ways: on solid walnut sculptured base, on turned

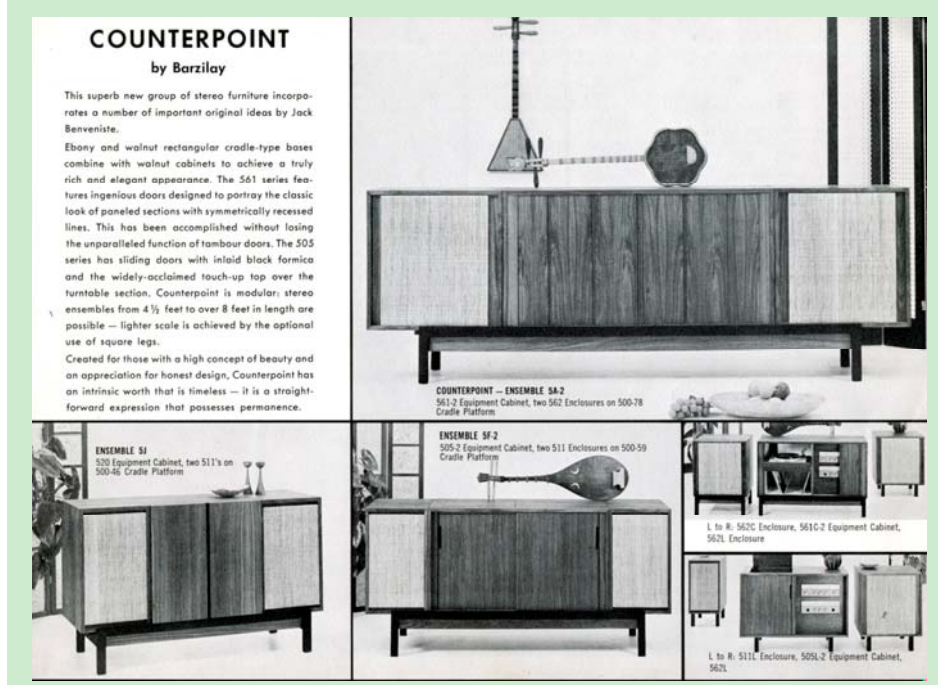
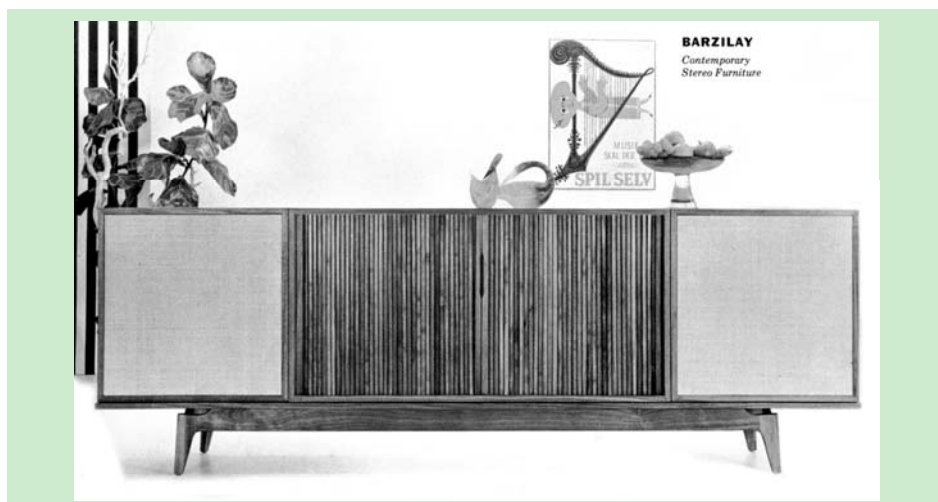


Fig. 7a (top): The Barzilay Ensemble 19A-2. Fig 7b (center): The Barzilay Precedent group. Fig. 7c (bottom): The Barzilay Counterpoint group.

legs, or without legs for use on benches.”

Figure 7b shows other Precedent Group selections.

Figures 7c and 7d shows the “Counterpoint.” Most of them look very similar, nevertheless, here’s how Barzilay describes the Counterpoint:

“Ebony and walnut rectangular cradle-type bases combine with walnut cabinets to achieve a truly rich and elegant appearance. . . . stereo ensembles from 4-1/2 feet to over 8 feet in length are possible. . . .”

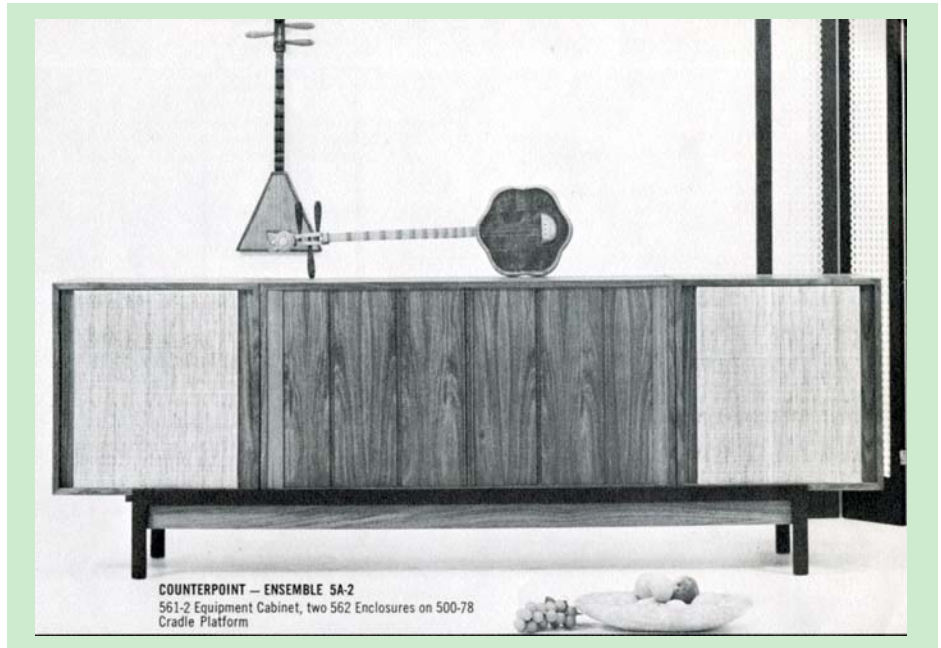


Fig. 7d: One of the Barzilay Counterpoint configurations, Ensemble 5A-2.

Recently I ran across this beautiful cabinet shown in Figure 8 on the internet. The description says it is a mid-century modern sculptured credenza in the style of Vladimir Kagan (1927-2016) and it was listed at \$14K. Vladimir started out by forming a partnership with the very famous industrial designer, Henry Dreyfus, in NYC in the 1950s.

So, if you ever come across a dusty, old stereo console at a thrift store, you may want to think twice before poo-pooing it. You just never know.



Fig. 8: \$14K Stereo cabinet in the style of Vladimir Kagan from www.abtmodern.com.

References

Barzilay's obituary published in the Los Angeles Times March 14, 2006.

Various furniture web sites such as: www.1stdibs.com and www.chairish.com.

Safety Requirements for Radio and Television Receivers 1928 to Present [1984]

By S.W. Coen and S. David Hoffman

This article first appeared in IEEE Transactions on Consumer Electronics, Vol. CE-30, No. 2, May 1984. It is reprinted under license from IEEE who retains full rights to this article. This article is not to be reproduced or distributed further without the express permission of IEEE. Thank you Arden Allen for suggesting this article be included in this Journal.

INTRODUCTION

THE CONSUMER electronics industry has seen significant technological progress during the last 50 years, especially with respect to radio and television receivers. Transitions from single-band, table-top radios in simple wooden cabinets to multi-band, multi-purpose communications receivers in stylish polymeric enclosures; from 4-tube hand-wired AM receivers to automatically-assembled, semiconductor-circuited entertainment centers; and from 5-inch black-and-white television receivers to remote controlled giant color screens epitomize this progress.

Standards for Safety¹ have had to keep abreast of the state of the art for these receivers, to consider field data, and, increasingly, to consider governmental and consumer interests. The following is a brief history of safety requirements for radio and television receivers as they developed between 1928 and the present.

1928 To 1933

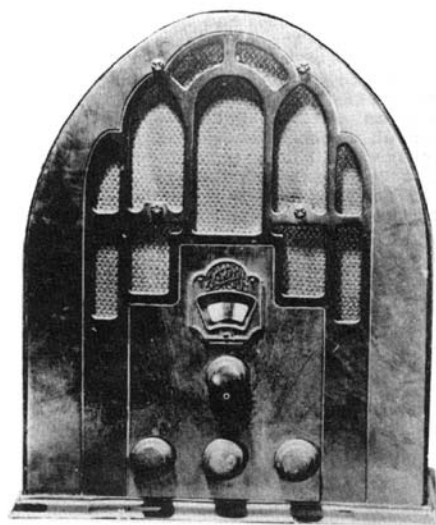
Initial Requirements

The first edition of the Standard for Safety for Power Operated Radio Receiving Appliances, UL 492, was issued in July of 1928. The standard only covered radios for noncommercial use, intended to be employed on circuits in accordance with the National Electrical Code.

The construction requirements were basic, covering the enclosure, supply circuit components, transformer, secondary voltages, spacings, and fuses. Enclosures were of wood or metal — or both — and they had to enclose

¹Wherever Standards for Safety are mentioned, the reference is to UL Standards.

The authors are with Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062. Assistance in producing this article was rendered by William P. Bird, an Engineering Assistant in the Standards Department of Underwriters Laboratories Inc.



all live parts. Openings in the enclosure were limited in size to prevent contact with live parts, and vacuum tubes were required to be serviceable without exposing the user to live parts.

All supply-circuit components were required to be evaluated individually. This meant separate evaluations for the power supply cord, on-off switch, lampholder, and attachment plug receptacle.

Transformers were required to be of the isolation type, with noncombustible enclosures.

Voltages on external output terminals could not exceed 25 volts; however, parts inside the enclosure but accessible during tube servicing could involve voltages up to 500 volts under certain conditions. One-half-inch spacings were required from primary parts to all exposed metal parts.

The performance requirements were even more elementary, with just three tests — input, temperature, and dielectric withstand — required. The only temperature limit was 90°C (194°F) on the exterior surface of the enclosure.

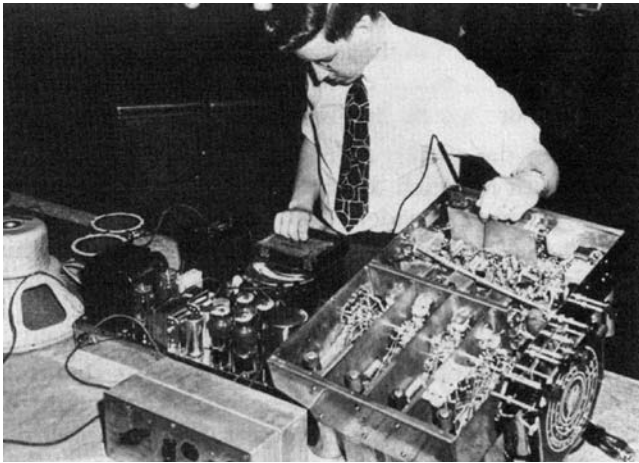
The marking requirements, compared with today's standard, were practically nonexistent. All that was required was the manufacturer's name and the electrical rating.

1933 To 1938

Secondary Voltage Limitations; Interlocks; AC/DC Supplies

While few changes were made in the second edition of the standard, publication of the third edition in April of 1933 resulted in significant limitations on secondary voltages. Whereas 500 volts had been permitted on secondary parts that would be accessible during user servicing of vacuum tubes, the new requirements restricted the voltage on such parts to 150 volts or less.

Electrolytic capacitors were required to be subjected to a 15-minute voltage test if the capacitor rating were exceeded during conditions of servicing (such as removal of tubes).



To further protect the user during tube servicing, requirements were added to cover electrical interlocks.

To address the problem of making the radio receiver user-serviceable while also protecting children from exposed parts, the concept was introduced that live parts are not considered to be exposed if a tool is required to gain access to them.

Temperature limits were assigned to rubber insulation on wire, "slow burning" insulation, fiber, windings using organic insulation, phenolic, and other parts of components. These temperatures were based on an ambient temperature of 24°C (75°F).

Requirements for radios operating from a direct-current source of supply or capable of operating from either an ac or dc source were added during this period.

Each product was now required to be marked with its catalog number, making it easier for both consumers and inspectors to identify the product.

Although the use of protective devices such as fuses and circuit breakers was encouraged, it was recognized that they were being defeated by users and servicemen. Accordingly, they were not relied upon for protection against overload conditions at this time, and they were shorted-out during testing. A 120-kilohm resistor connected between an inductor or capacitor and the supply circuit was considered to provide protection against fire for an inductor or capacitor. These components, protected by such a resistor, were not required to be within a noncombustible enclosure.

The fourth edition (1935) of UL 492 was essentially an editorial update of the third edition.

1938 To 1942

Capacitors

The major change between the fifth (1938) and sixth (1942) editions of the standard established a limit on the size of capacitors used between line and chassis and between line and the antenna or ground. To reduce the risk of electric shock, the size of the capacitor between line and chassis was limited to 0.25 microfarad; between line and antenna or an external ground connection, 0.1 microfarad. These requirements foreshadowed future requirements for leakage current.

1942 To 1950

Advent of TV; Parameters for Fire and Shock; Leakage Current Test

The sixth edition (1942) of the standard was relatively dormant during the war years. After 1946, however, the radio industry got back into production and television receivers started to appear on the market. Although the scope of the standard was revised to include television receivers, very few requirements specifically addressing them were included at this time.

Parameters defining fire and shock hazard were included for the first time, though. The standard also defined a "noncombustible" enclosure with respect to type and thickness of materials used, number and size of openings, and volume of the enclosure.

All capacitors and inductors connected in the supply circuit were required to be housed in a "noncombustible" enclosure. Components connected in the load side of a rectifier tube having a tapped filament, connected so that all current passed through one of the taps, were exempt from this requirement.

To reduce the risk of fire from an underrated component, on-off switches were required to have voltage and current ratings equal to or greater than the rating of the circuit they controlled.

As previously stated for the years 1933-1938, fuses had been encouraged but not required. Now a radio for use on a storage battery was required to have a fuse in the battery circuit.

Additional construction requirements addressed risks of injury from both fire and shock. To protect a wire against mechanical abuse during servicing, rubber insulation was required either to be at least 1/32-inch thick or to have a cotton braid over it. Wiring subject to motion was required to be provided with strain relief, and, if it passed through a metal chassis, the exit hole had to be free of sharp edges that might damage the insulation. Cords or cables used outside the enclosure were required to be heavy duty, Type SJ cord.

The strain-relief requirement was backed with a 35-pound pull test on the power supply cord. And a short-circuit and arcing test was added to determine whether or not an external cable could produce a risk of fire.

Perhaps the most significant new test during this period was that for leakage current. A test method, complete with circuit specification for a diode-vacuum-tube meter to measure voltage and current for determining shock hazard, was described in the standard. External accessible parts were limited to a leakage current of 5 milliamperes; parts accessible only during user-servicing were limited to 15 milliamperes.



1950 To 1957

Thermoplastic Enclosures; Hot Chassis for Radio; High-Voltage Circuits; and Implosion Tests for Television Receivers

In the early 1950's manufacturers started to employ enclosures made of thermoplastic materials. Investigations were required to determine whether the enclosures increased the risk of injury from fire.

In general, 3/8-inch-thick wood or 1/8-inch-thick phenolic enclosures were acceptable to protect against fire if (1) the volume of the chassis did not exceed 200 cubic inches, (2) the chassis used 60 watts or less, (3) the power supply was a directly-connected type having a vacuum tube or selenium rectifier with a series resistor, and (4) the enclosure openings didn't exceed certain limits with respect to number and size. If a manufacturer wished to use openings exceeding these limits, an iron-wire test would be conducted in which all combustible components inside the enclosure were ignited to determine whether or not flames would escape the enclosure.

Within the enclosure, many radio designs made use of a circuit in which the tapped filament of a vacuum-rectifier tube provided overload protection. Such a circuit was acceptable if the filament opened within 1 minute when carrying a current of 600 milliamperes.

Concern with fire was also reflected in the addition of abnormal operation tests to simulate faults in components. A fault would be introduced with the radio connected to a 30-ampere supply. Cheesecloth would be placed around the cabinet, or, in the case of a capacitor short-circuit test, around the capacitor itself.

Hot chassis radios became popular in the 1950's, making additional requirements for electrical interlocks and captivated knobs on control shafts necessary. Additional marking requirements were also added, to inform the user and serviceman that special precautions should be taken during servicing of a radio with the chassis connected directly to one side of the line.

Television receivers were deleted from the scope of the standard because they were covered in a separate publication that was published in July of 1950.

Concern about the increased risk of fire from high-voltage television circuits involving voltages greater than 2.5 kilovolts resulted in high-voltage arcing tests. High-voltage components, such as a flyback transformer, were required to be in a noncombustible enclosure (usually a metal cage). The size and number of openings in the enclosure (cage) were limited to restrict the escape of flames in the event of fire.

Contrary to the practice developed in the mid 1930's for radios, fuses were relied upon to reduce the risk of fire in television receivers. Of course, the television receiver had to be marked to caution the user or serviceman that the fuses should be replaced only with fuses having the same voltage and current ratings.

An implosion test was required on each television receiver unless the protective window in front of the picture tube was made of laminated or tempered glass having a minimum specified thickness, which depended upon the size of the picture tube. Requirements limited the openings in the enclosure to restrict the throw of glass in the event of a spontaneous implosion.

Abnormal tests were added to simulate mechanical abuse. The entire television receiver, including the protective window, was required to withstand an impact of 5 foot-pounds. The edges of a tempered glass window were struck by a hammer if the edges of the glass were exposed.

Markings were required to warn the user against handling high-vacuum picture tubes, and to indicate that such tubes should be serviced only by qualified personnel.

Color receivers became available during this period, but only a small number were on the market. A problem that came to the fore was the increased potential for x-radiation emissions due to the higher second anode voltages on color sets. Both black-and-white and color television sets were investigated for the emission of x-radiation, but no limits were established.

1957 To 1958

X-Radiation; Moving Parts; Fuses for Radios; High-Voltage Components; Printed Wiring

In January, 1957, the requirements for television receivers that had been issued in a separate publication in 1950 were incorporated into the ninth edition of the standard. The Standard was retitled "Radio and Television Receiving Appliances."

X-radiation emissions were limited to 2.5 milliroentgens per hour. The standard noted that a limit of 0.5 milliroentgen per hour was being considered by the International Commission on Radiological Protection.

Risks posed by moving parts, such as the mechanism of a record changer, were addressed for the first time. Moving parts, such as gearing and linkages, that posed a risk of injury were required to be inaccessible during normal use.

Another first was the acceptance of Types C and N fuses (noninterchangeable fuses requiring special holders) and soldered-in fuses as protection against the risk of fire in radios. Previously shorted during abnormal tests, these fuses were now left intact in the circuit.

High-voltage circuits were required to withstand a high-voltage dielectric-withstand test of 1.25 times maximum voltage plus 1750 volts. The standard offered several options for evaluating high-voltage components with respect to risk of fire. The components could (1) be enclosed in a high-voltage enclosure of noncombustible material, (2) be subjected to a dielectric-withstand test of 2 times maximum voltage plus 1000 volts, or (3) be subjected to a high-voltage arcing test.

Because capacitors in the supply circuit had been the subject of reports of field failures, a flame test was required to judge their enclosures.

The circuitry of color television receivers was investigated to determine those points capable of producing 150 watts of power. These points were subjected to overload and short-circuit tests. Electrolytic capacitors, rectifiers, and vacuum tubes were considered to be unreliable components and were also subjected to short-circuit tests to simulate their failure.

Requirements were added to cover the handling, disconnection, or displacement of parts inside the enclosure of an appliance during normal operation, user servicing, or shipping.

At about this time, printed wiring assemblies began to be widely used. Special overload and dielectric-withstand tests were included to address printed wiring boards. An optional arcing test was permitted in lieu of the dielectric-withstand test.

In the early 1950's the first use of thermoplastic materials resulted in requirements and conditions for the acceptance of such materials for the support of live parts. Test requirements were added to judge the mechanical strength and temperature stability of polymeric enclosures. Back covers of pressed-board material were required to withstand an impact test of 4 foot-pounds and a bending moment test of 5 pound-feet.

To reduce the possibility that antenna terminals would present a risk of electric shock, all antenna terminals were required to be connected to the supply circuit through a resistor not exceeding 1 megohm. The purpose of the resistor was to prevent a buildup of voltage on the outside antenna that might break down critical insulation inside the receiver, which would then place line potential on the antenna terminals. Ceramic-dielectric capacitors connected between the line and exposed metal were subjected to a dielectric-withstand test of 1500 volts ac.

1958 To 1964

Overload Tests; Polarized Plugs; Additional Implosion Tests; Factory Dielectric-Withstand Test

The tenth edition of the standard included several new requirements to address the risk of fire. A flyback-ignition test was included as an alternative to the use of a noncombustible enclosure around all high-voltage parts of a television receiver. Direct-connected radios were investigated to determine the points in the circuit capable of delivering a power of 50 watts. Overload tests were conducted at the 50-watt points and all unreliable components, such as vacuum tubes, capacitors, and rectifiers, connected between the 50-watt points and the power supply were subjected to short-circuit tests. This represented an increase in the number of circuit points subjected to overload tests and reflected an increased concern for the potential of fire. A burning-rate test was added for high-voltage wire insulation.

To reduce the possibility of electric shock, openings in the top of a television receiver were restricted in size to prevent the passage or dropping of objects through these openings. Requirements were also added to cover products employing polarized attachment plugs; however, the use of a polarized plug was optional.

To reduce the leakage current at the antenna terminals, the maximum resistance value of the conductive resistor between the supply circuit and the antenna was increased from 1 to 4 megohms. If a product had provision for connection to another product, the leakage current was limited to 2.5 milliamperes so that the combined leakage of the two would not exceed 5 milliamperes. The leakage current from any one set of antenna terminals was limited to 1 milliamperes.

To address the problem of static charges building up on the antenna and stressing isolating components, spacings, and insulation inside the receiver, a voltage-surge test was required. This test consisted of 50 discharges, from a 0.001-microfarad capacitor charged to 10 kilovolts, applied between the antenna terminals and the chassis.

Test methods were added to judge the implosion protection of high-vacuum cathode-ray tubes. These consisted of a high-energy impact method and a thermal shock method. The thermal shock test method was preferred as it more nearly simulated conditions that might trigger a spontaneous implosion. For the first time the

standard spelled out permissible limits on glass throw with respect to the distance the glass was thrown and the weight of the pieces of glass. During this period picture tubes provided with integral implosion protection were introduced and markings were required to warn that such a picture tube should not be replaced by one not provided with integral implosion protection.

All products employing thermoplastic enclosures were subjected to a 60°C (140°F) hot room test for 7

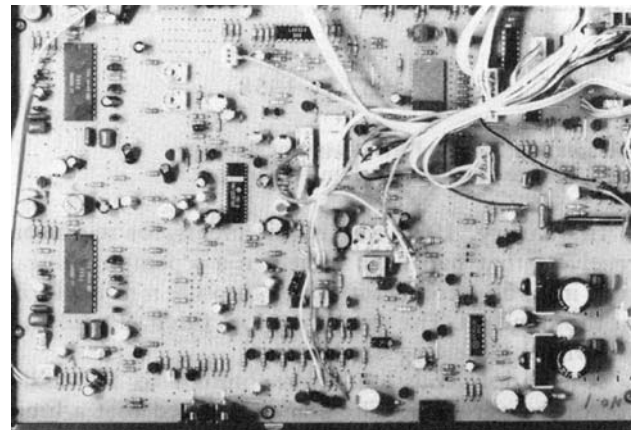
hours as an alternative to the 90°C (194°F) oven test. When in the 60°C hot room, the product was operated from a 130-volt source of supply.

A 100-percent factory-dielectric-withstand test of 350 volts ac for 1 second was required to detect errors that might have been made in production.

1964 To 1968

Transistors; Fires in Color Sets; X-Radiation

In the mid 1960's transistors began to enter the picture, replacing vacuum tubes. Since transistors were not considered to be serviceable by the user, the original concept of user servicing had to be changed. Products containing only transistors were required to be marked with a "no-user-serviceable-components" warning instructing the user not to attempt servicing but to refer it to qualified service personnel. Because of this change, all types of fuses were accepted as protection against overload conditions if replacement markings were provided.



During this period the industry and UL became aware that fire incidents were occurring in color television receivers. Field investigations indicated that some of these fire incidents resulted from problems related to on-off switches, across-the-line capacitors, and high-voltage components. Steps were taken to upgrade the requirements to address these problems.

Requirements were added to prohibit the use of a separable cord set having a cord connector that could be used as a "cheater" cord to defeat the electrical interlocks of television receivers.

The limit for X-radiation emissions was reduced from 2.5 milliroentgens per hour to 0.5 milliroentgens per hour, measured at a distance of 5 centimeters from the enclosure.

1968 To 1976

CPSC Involvement; Response to Field Reports; Change from Containment to Prevention

By 1966 the standard contained so many requirements that it had become difficult to use. At the suggestion of the Electronic Industries Association, an ad hoc committee consisting of industry members and UL staff was given an assignment to rewrite the standard to make it easier to use. Changes proposed by the committee were strictly editorial, as the committee had no authority to make technical changes. The result of this work was the twelfth edition of the standard published in September of 1968.

During 1969 and 1970 the National Commission on Product Safety held hearings to investigate the safety of television receivers, particularly color television receivers. During those hearings the problems that had already been identified by industry and UL were discussed.

In 1972, the National Commission on Product Safety was replaced by the Consumer Product Safety Commission (CPSC). Within two years the CPSC had "preliminarily determined" that television receivers presented an unreasonable risk of injury to the general public and asked for offers to generate a proposed mandatory standard for television receivers. UL's bid to serve as an offeror for this task was accepted.

For the next 14 months UL worked with various committees to produce the standard. These committees were composed of technically-oriented and use-oriented representatives of ultimate consumers and consumer groups; television receiver manufacturers; component manufacturers; retailers; and others, including representatives of insurance interests, inspection authorities, television servicemen's organizations, safety experts, fire marshals, utilities, and testing laboratories. At least one-third of each committee comprised consumers. Five separate drafts of the proposed mandatory standard were generated by the main committee and the final draft was presented to the CPSC on July 6, 1976.

Prior to and during this work on the proposed mandatory standard, industry and UL had instituted a number of changes in the UL standard, all of which were aimed at addressing problems that had been identified in the field.

The permissible leakage current from all exposed parts was reduced to 0.5 milliamperes. The antenna-conductive-path resistance was increased to 5.2 megohms in order to reduce the leakage current from the antenna.

Polarized attachment plugs, which had been optional, were now required on all television receivers. Casualty (mechanical) requirements were added to the standard to cover carts and stands. These included temperature stability, wheel or caster securement, tip stability, cart or stand loading, cart or stand impact, and handle tests.

Materials used for enclosures and for the support of live parts were upgraded with respect to flammability and resistance to arc tracking.

The requirements for on-off switches were upgraded with respect to the flammability of materials used, the number of openings permitted, and the number of tests required for these switches; such switches were known as TV-rated switches and were required to be used in all appliances having an inrush current exceeding 1.414 times the switch rating in amperes. Wiring, sleeving, tape, and tubing were required to have a flame retardant rating.

There was a general change in philosophy from relying upon the containment of fire to preventing a fire from starting. Less emphasis was placed on component enclosures, and more emphasis was placed on the components themselves and better use of less flammable materials. The option of accepting high-voltage parts based on dielectric-withstand tests and flyback-ignition tests was deleted from the standard and all high-voltage components were required to comply with the high-voltage arcing test. These changes represented additional efforts to address potential fire problems by requiring the use of better materials as they became available and by increasing performance testing.

The criterion for judging the risk of fire was changed from ignition of cheesecloth placed over the overall enclosure of an appliance to flaming within the appliance that continued for more than 30 seconds. Abnormal operation tests were conducted down to the 15-watt levels, although with the use of less flammable materials and materials having better arc-tracking characteristics, much of this testing was found to be unnecessary and the level was increased to 50 watts if certain constructions were employed.

The television industry also put much effort into reducing the X-radiation that might be emitted from television receivers. Use of more lead and strontium in the glass of the picture tube reduced emissions considerably from that source. Since transistors and other solid state components had almost completely replaced vacuum tubes by this time, other sources of X-radiation such as the high-voltage regulator and rectifier tubes were no longer present. X-radiation readings were averaged over an area of 10 square centimeters and the receiver was required to meet the 0.5-milliroentgen-per-hour limit with faults introduced into the circuit. The industry also used high-voltage "hold-down" circuits to limit high voltage. The use of new materials, components, and circuits was so effective in reducing X-radiation that it became difficult to measure emissions, even with the most sensitive equipment available.

1976 To 1983

Splitting the Standard; CPSC's Findings; Recent Requirements

Because the standard was becoming so large and, in many cases, radio, television, and video products were made by different industries, it was decided to split the radio and television standard into three separate standards, as follows: Radio Receivers, Audio Systems, and Accessories, UL 1270; Low-Voltage Video Products Without Cathode-Ray-Tube Displays, UL 1409; and Television Receivers and Video Products, UL 1410.

Between 1976 and 1979, the CPSC came to the conclusion that a mandatory standard was not needed. On October 19, 1977, the CPSC terminated the notice of proceeding to develop a mandatory standard with respect to electric shock, implosion, and casualty (mechanical) hazards. On July 19, 1979, the CPSC voted to terminate the notice of proceeding to develop a mandatory standard to address fire hazards. Combined with the CPSC's previous notice, this action ended the proceeding in its entirety. CPSC based its actions on (1) the results of a fire-containment feasibility study, (2) data showing a decline in field incidents involving the later model television receivers complying with the voluntary standard, (3) the adequacy of the voluntary standard covering television receivers, and (4) recommendations by the CPSC staff and all contractors and consultants who had evaluated the proposed mandatory standard.

Independent of the CPSC proceedings, the revision process continued as the revised television receiver standard kept pace with the state of the art. Requirements were

added to UL 1410 to cover television receivers intended for use in hospitals or in health care facilities, and to cover appliances intended for on-board marine use. Additional requirements were added to protect against casualty when television receivers were used on carts or stands. A sharp edge tester was used to test edges.

All three standards contained upgraded requirements for enclosures and insulating materials from the standpoint of flammability, resistance to ignition, and arc-tracking. Cabinet surface coatings and grille cloth for television receivers were required to pass a burning methenamine pill test intended to simulate a cigarette left burning on the enclosure surface. Television receiver cabinets made of polymeric materials were required to have a flammability rating of 94V-0. And all three standards required that polymeric enclosures be covered by a program to facilitate proper identification of the materials being used to mold the cabinets.

A voltage surge test was added to address the high voltages that may build up on an external antenna. These voltages may damage insulation and components within a receiver in such a way that a risk of electric shock may result. A leakage current test after humidity conditioning was added to the television receiver standard to simulate the conditions experienced in very humid climates. All products were required to use attachment plugs having a larger face and the easy-grip configuration. Television receivers were required to be provided with a second level of protection against electric shock for parts commonly touched by the user, such as the earphone jack, user control buttons, knobs, shafts, antenna terminals, and enclosures made of conductive material.

To reduce the possibility of mechanical damage to the cord, television receivers were required to employ heavier duty power cords. And isolating power transformers were required to meet the construction and performance requirements of the Standard for Transformers, UL 1411.

Finally, each radio, television, and video product was required to leave the factory with a set of safety instructions packed in the carton. These instructions addressed those areas in which the user himself can control safety by his own actions.

CONCLUSION

The foregoing covers only a few of the more important changes made in the safety requirements for radios and television receivers over the years. What we can expect in the future is hard to predict, but one thing is certain - the requirements will change with the state of the art.

METHOD OF DEVELOPMENT AND REVISION OF UL STANDARDS FOR SAFETY

UL Standards for Safety contain requirements for the construction and performance, under test and in actual use, of radio and television receivers. The requirements in these standards are based upon sound engineering principles, research, records of tests, and field experience. The problems of manufacture and use are considered after consultation with manufacturers, users, and others having specialized experience.

The procedure employed to develop Standards for Safety provides for participation and comment by the affected public, including individual consumers and consumer groups, as well as industry. Manufacturers, consumers, representatives of consumer groups, academicians, government officials, inspection authorities, representatives of insurance interests, and others provide input for use in formulating the standards.

Following discussion with a small industry advisory group selected for their knowledge and recognized judgment in the specific product area under consideration, proposals and draft standards are circulated for review and comment to:

1. The appropriate Engineering Council or Councils (persons having enforcement authority in the public safety field, government officials having responsibility in establishing

safety standards, and in the specific areas of interest),

2. Concerned government agencies,
3. Manufacturers,
4. Consumers and consumer groups, and
5. Volunteers who expressed a desire to participate by responding to the routine public announcement that the standards development project would be undertaken.

All comments and suggestions from these sources are considered and resolved or answered. Such changes in the proposal or draft standard as appear to be proper, necessary, or desirable are made. If they are technical changes, a revised draft of the requirements is prepared and is resubmitted to all who have participated so that they may again make comments and suggestions. After every comment received has been carefully considered and satisfactorily resolved or answered the draft or proposal is issued as a published standard or as revised requirements.

Published requirements are revised as further experience and investigation show that changes are necessary or desirable. The revision process is identical in all respects to that of development of a new standard.



S. W. Coen received the B. S. degree in physics from Monmouth College in 1947. As a member of the U. S. Army Signal Corps, he installed, maintained, and operated a radio and teletype station. Currently an Associate Managing Engineer in charge of the television and radio testing and certification section in the Northbrook Electrical Department of Underwriters Laboratories Inc., Mr. Coen has over 35

years experience investigating systems and products for UL. He is a member of the Illinois Society of Professional Engineers.



S. David Hoffman received the B.E.E. degree from Yale University and the L.L.B.J.D. from St. John's University. He has taken postgraduate courses at Harvard, Cooper Union, and Columbia.

As Vice President and General Counsel of Underwriters Laboratories Inc., his administrative and executive duties encompass legal product safety, litigation, legislation, certification, and standardization matters. He was the Project Manager and Chairman of the committee that worked on proposed federal mandatory safety standards for television receivers.

He is the author of numerous articles on product liability and standardization, and he serves as an Adjunct Professor of the University of Illinois in Chicago.

Vintage Television Enthusiast Meet - 2024

By Richard Watts

The vintage television enthusiast group met at the CHRS museum on May 18th. Tom Albrecht was the host this year. There were about 25 attendees. The agenda of presentations lasted the entire day from 10am until 4pm with lunch provided. Items from attendees' collections were displayed. The presentations were as follows:

John Staples gave two talks. He first described the color circuitry employed by RCA in their first color sets (CT5 and CT9). He also discussed the comparison of the CBS system to the NTSC system. John walked through the design decisions to implement the NTSC RGB color system starting with a brief overview of color theory, then discussing the basis for producing the RGB signals. He then presented in detail the encoding and phase relationships of the RGB signals for transmission and for demodulation in the early sets.

In his second talk, the "RCA CT-100 Was Not the First NTSC Color Set," John describes the Westinghouse H840CK15 color set that came out in February 1954, preceding the CT-100 April 1954 release by 3 months.



Tom Albrecht presented details about the "Beam Relaxor" Horizontal Deflection circuit used in the 1946 Farnsworth GV-260. This circuit provided a free-running sawtooth oscillator that was triggerable with incoming sync pulses and provided high current to drive the yoke and high voltage generation -- and it was done with just one 6L6 vacuum tube.

Tom and Nate Pendleton discussed the restoration of a 1939 General Electric HM-185 prewar set.

Nat Pendleton walked through the early history of color television broadcasting starting in 1951 with early efforts by CBS to establish its system without success. He then presented RCA's preparation for a 1954 launch of NTSC color programming. He showed that by 1956, color broadcasting was gaining traction in a number of large cities across the U.S. that offered at least some live programming. Then he showed how it became mainstream in the 1960s and 1970s.



Fred Deal had us revisit an example of a family's difficult decision to use precious limited funds to buy their first television in the 1950s with a large screen replay of the Real McCoys episode "The Television Set." In this episode, the family chooses a Hallicrafters 7" black and white set complete with channel 1 like the one at right.



Bay Area Radio Hall of Fame Inductees - 2024

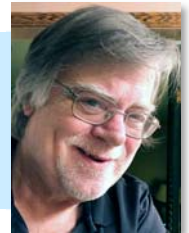
By John Evans



Bay Area Radio Hall of Fame inductees for 2024 were announced July 20th by Ben Fong-Torres and Renel Brooks-Moon during the CHRS Radio Day event. They were again honored at the Broadcast Legends luncheon on October 19th.



PROGRAM HOST: Trish Bell. Trish has spent the past four decades on the radio here in Northern California getting her start in Monterey, shifting to rock at KSJO in the '80s, and various other formats including adult standards at KABL, pop hits at Big 98, Smooth Jazz at KKSF and the Quiet Storm at KBLX. Trish is still doing shows for the tribute streams honoring the legendary stations KABL and K-ZAP Sacramento.



PROGRAM HOST: Marvelous Mark McKay. Mark spent roughly ten years, from 1974 to 1984 at the Big 610 KFRC and is best known for doing afternoons. He also served as the assistant program director for Michael Spears and later, Les Garland. In the mid '70s, Mark replaced his idol Bobby Ocean to become the imaging voice for KFRC. In 1984, Mark left KFRC and helped launch Hot Hits KMEL, broadcasting the inaugural show.



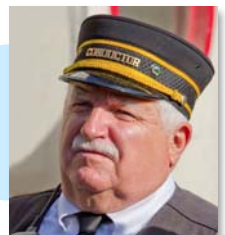
PROGRAM HOST: Miranda Wilson. Miranda is an Oakland native and grew up listening to the radio greats of the '60s and '70s. She seasoned her craft at KSOL and then spent 18 years at Smooth Jazz KKSF. She is best known for holding down the top-rated mid-day show and was a highly sought-after emcee for station concert events and listener parties. Miranda also spent a couple of years at KBLX hosting the Sunday faith music show.



NEWSCASTER: Liz Saint John. For the past several years, Liz has been a weekend anchor and go-to vacation relief anchor on weekdays at All News KCBS. Liz has spent 40-years on Bay Area radio, most of them as a news presenter and public affairs director at KRQR and Alice 97.3.



SPORTSCASTER: Tom Tolbert. Tom played for seven seasons in the NBA before joining KNBR as a sports-talk host. He has spent the past 28-years entertaining sports fans every weekday afternoon on KNBR. From 2012 to 2016, Tom joined the Golden State Warriors Radio Network as color commentator alongside play-by-play announcer Tim Roye.



ENGINEERING: Kent Hedberg. Kent's legacy includes the magical call letters KFRC. He worked for the Big 610 during its Top 40 heyday, through its format change to Magic 61, to its shift to '60s and '70s oldies on AM and FM. In the early '80s when KFRC bought and built a mobile broadcast studio known as the Sturgeon, Kent was its chief conductor and engineer. That very mobile studio is operational today.



MANAGEMENT: Richard Sands: In 1985, Richard was the chief architect of the Bay Area's first-ever alternative rock station, Live 105. He was program director for 13 years leading the station to high ratings and national prominence. Live 105 was at the center of the Bay Area's club scene and attracted huge crowds to alternative rock concerts. After leaving Live 105, Richard joined the Gavin Report in San Francisco as the alternative music editor and later launched his own industry newsletter, The Sands Report which he still runs today.

SPECIALTY: Sandee Althouse. Sandee has been a local radio staple since the '80s when she covered traffic reports on the KRQR morning show with Peter B. and Michael Knight. After short stints announcing for other Metro Traffic clients including KGO, Sandee joined KQED as an announcer/operator. She remains one of the longest tenured on-air talents at KQED...more than 30-years...and counting.



EDUCATOR: Kevin Gorham. Kevin has been a teacher at Encinal High School in Alameda for the past two decades. He teaches AP Government and Economics and Broadcast Journalism. Encinal has its own radio station and Kevin oversees the morning news show. He also has fostered a close relationship with the California Historical Radio Society and brings his students to our Museum and studios on field trips. Prior to teaching, Gorham spent 20 years producing morning shows in the Bay Area, mostly notably the Don Bleu show on K-101 in the '90s and early 2000s.

NEWS: Larry Bensky was known for his sharp journalism skills and his political activism. At Pacifica's KPFA in Berkeley, Larry covered many of the biggest stories including political conventions, presidential debates, Senate hearings for four US Supreme Court justices, and the Iran-Contra and 9-11 Commission hearings. He also hosted a talk show and served as general manager of KPFA from 1974 to 1977. At KSAN he worked as a news anchor, reporter, and talk show host. Bensky railed against nuclear armament, the Vietnam War, and the death penalty; he advocated for Greenpeace, the Sierra Club, and the United Farm Workers. Larry was a French scholar and teacher at Stanford, Cal State-East Bay and Berkeley City College.



EDV#DUHD#UDGLF#KDOO#RI#DPH#OHJHQS#

Jane Riley spent 30-years at KCBS both on-air and in management. Herb Caen referred to her as the Queen of KCBS where she produced Bay Area Women and interviewed more than 2,000 women in business and all walks of life from the late '60s through the '70s. She later moved into management.

Frank Knight did it all for KCBS from hosting a music show, to anchoring the news. Frank spent four decades at KCBS retiring in the early 2000s.

Dick Leonard got his start on the San Francisco airwaves in the early '50s working for KNBC and later KCBS. He is best known for the decades he spent at KGO Radio as a street reporter and the City Hall Bureau Chief.

Bonnie Chastain worked for KSFO and later KCBS which is where she met her husband, morning news anchor Dave McElhattan before his jump to TV. Bonnie would later become the morning newscaster and news director at KOIT.

Clancy Cassell spent nearly 40-years at KCBS joining the station during its KQW days in San Jose, retiring from the newsroom in 1983. Many of his co-workers considered him the best of the best.

Sam Skinner was a sportscaster for decades, worked at Lucky 13 KDIA and was also a color commentator for Oakland Raiders radio broadcasts in the early to mid '60s. Sam ended his sports broadcasts with the saying, "And if you can't be a good sport, don't bother to play the game."

Knowles Robertson was news and public affairs director and anchor for country music stations KNEW and later its sister station KSAN. Knowles was active in the RTNDA and was one of the earliest and founding members of Broadcast Legends.

LEGENDARY STATION:

KDFC went on the air on September 1, 1948, as one of the first FM stations in the Bay Area. More than 75 years later, it has retained its original format longer than any station in the Bay Area under one set of call letters. It has served the community with Classical music for decades and has continued to do so long after the last competing Classical station left the market 25 years ago.



Classical[®]
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Cashiers Heidi, Richard & Walt

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Neethu & Heidi



Len



Jon & Betty



Carlos



Marjorie & Kim



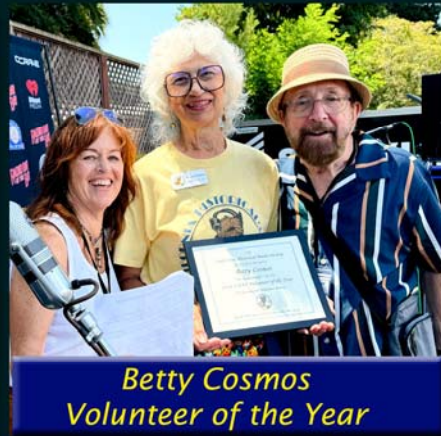
Mitch & Terzah



Marilyn Ezzy Ashcraft
Alameda Mayor



Ken Miller
CHRS Founder Award



Betty Cosmos
Volunteer of the Year



Dan Ashley Performs



Radio Play: "Our Miss Brooks - Puppy Love"



More Radio Day



Steve Kushman



Denny Monticelli Demonstrates Spark Radio



Rachel Lee



Surplus Clearance